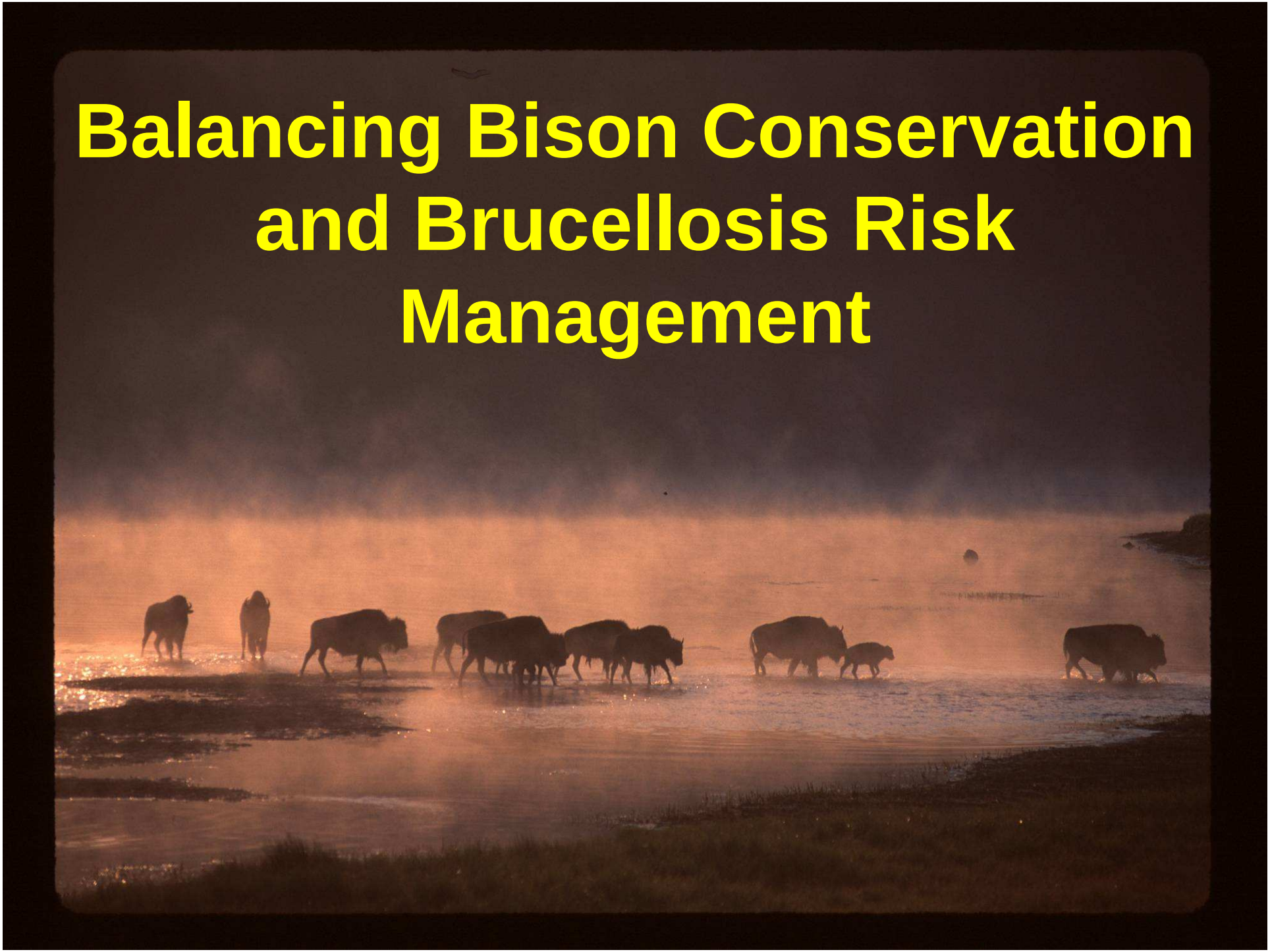
Balancing Bison Conservation and Brucellosis Risk Management



Yellowstone buffalo are the most important wild herd in the United States.

Buffalo need to be managed

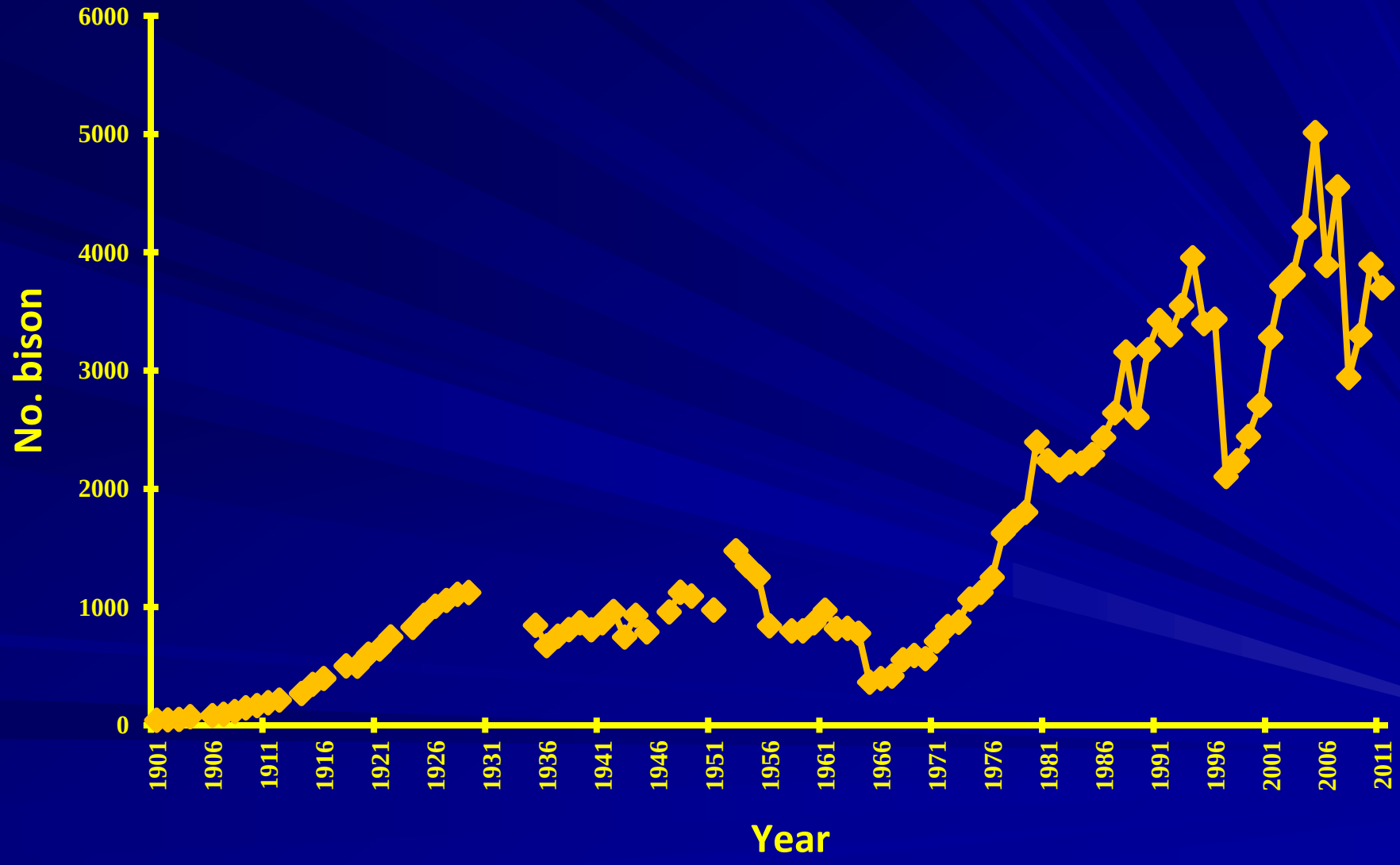
The NPS Mission

Preserve native species and ecological processes that sustain them

Surplus buffalo can be used for food

Buffalo are migratory wildlife, not livestock.

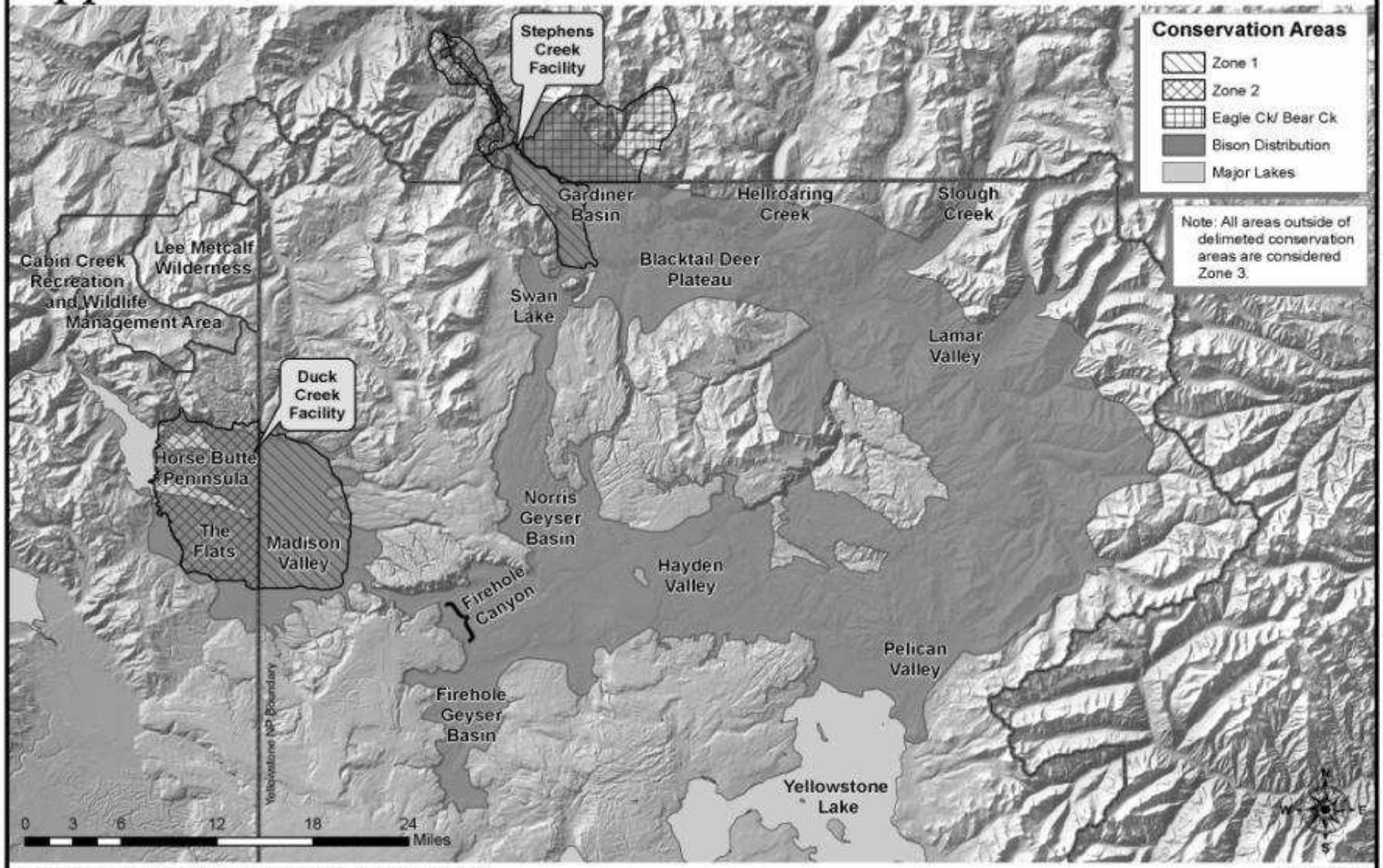
Conservation Success



Yellowstone National Park
Wyoming - Montana - Idaho

National Park Service
U.S. Department of the Interior

Appendix A. Yellowstone Bison Conservation Area

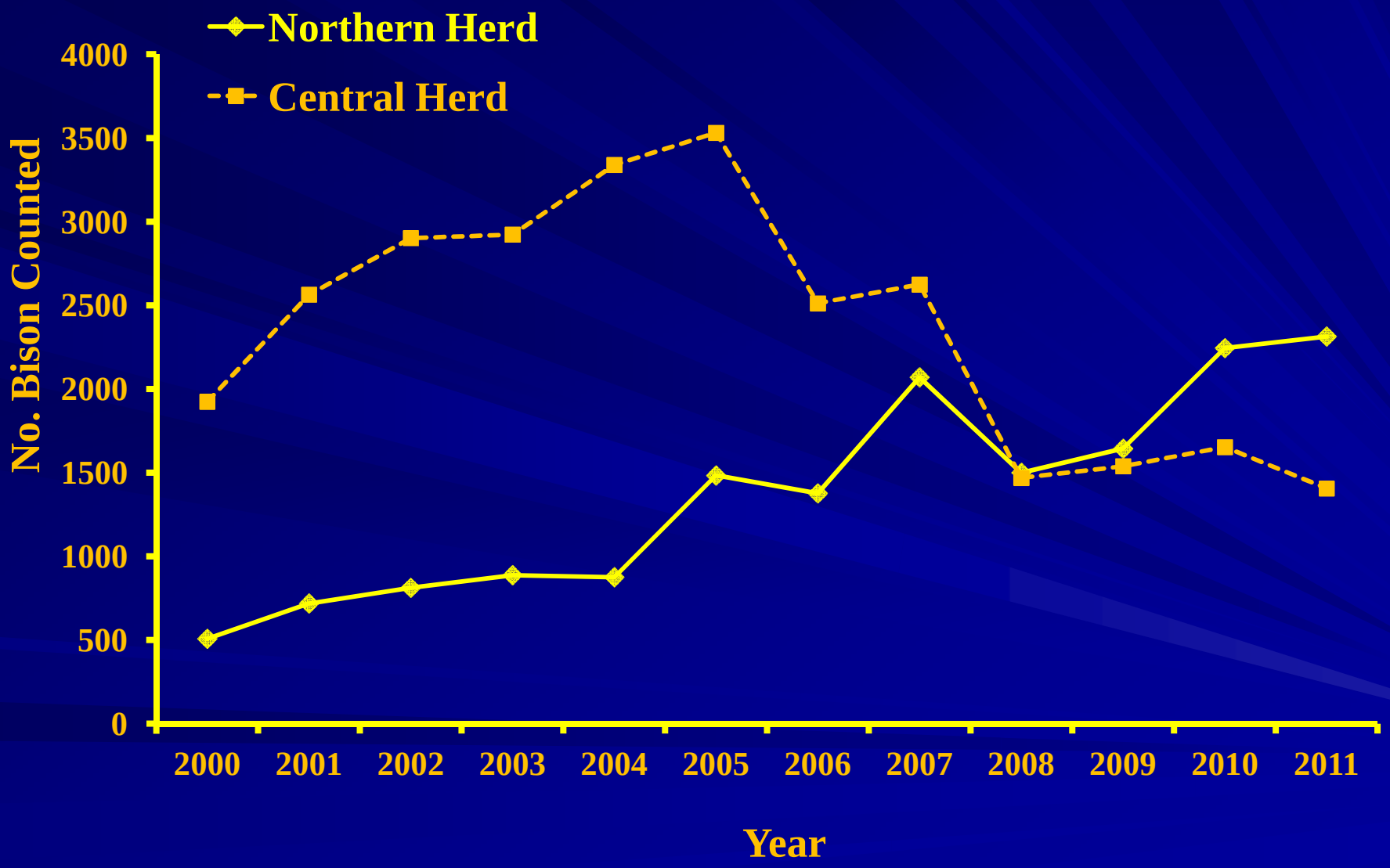


Produced by the Yellowstone Spatial Analysis Center 307-344-2246

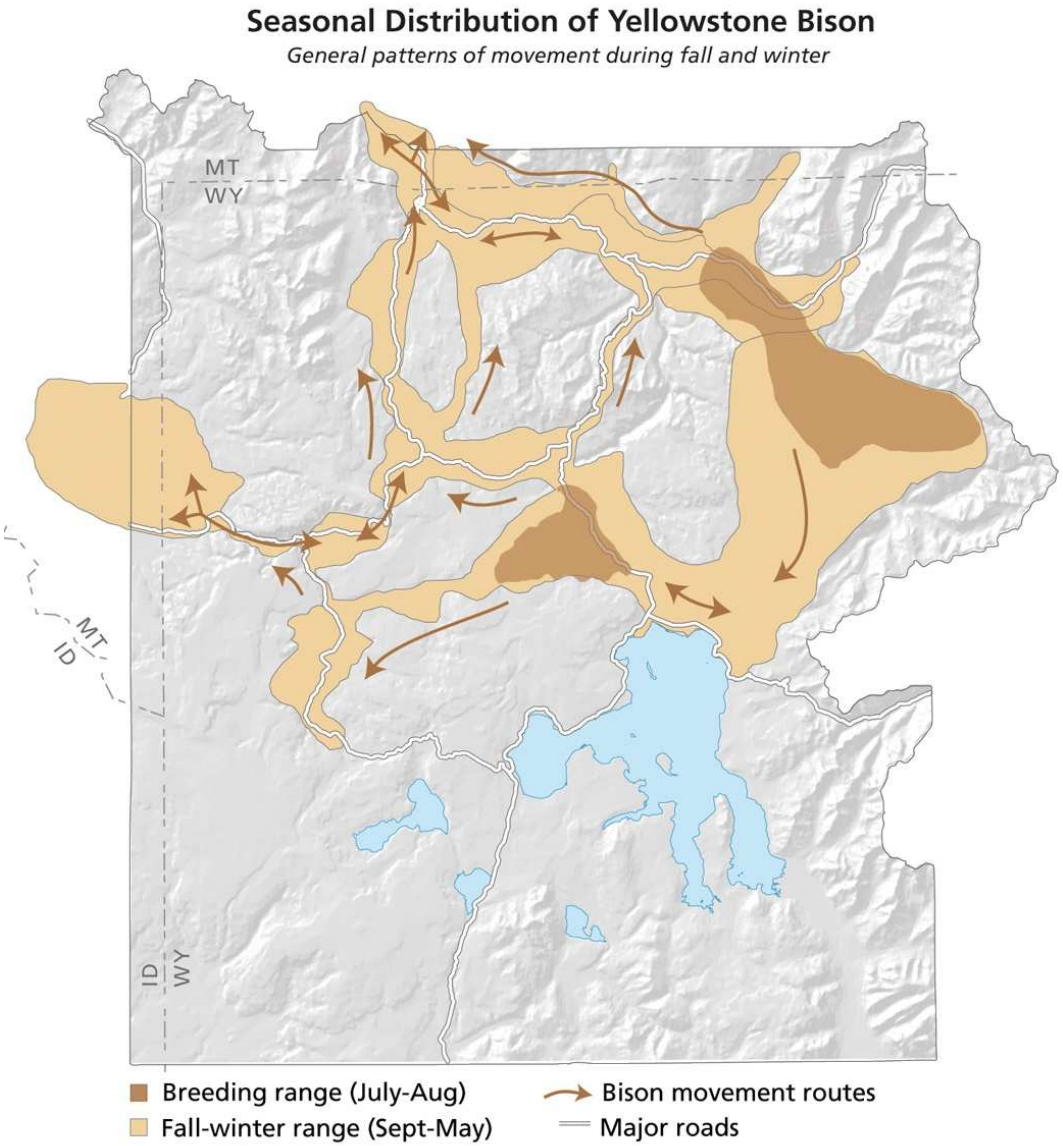
June 2009

FILE: S:/smiller/Projects_2008/Bison_Hazing/ArcMap_Projects/Yell_Bison_Conserv_Area.mxd

Conservation Success Story



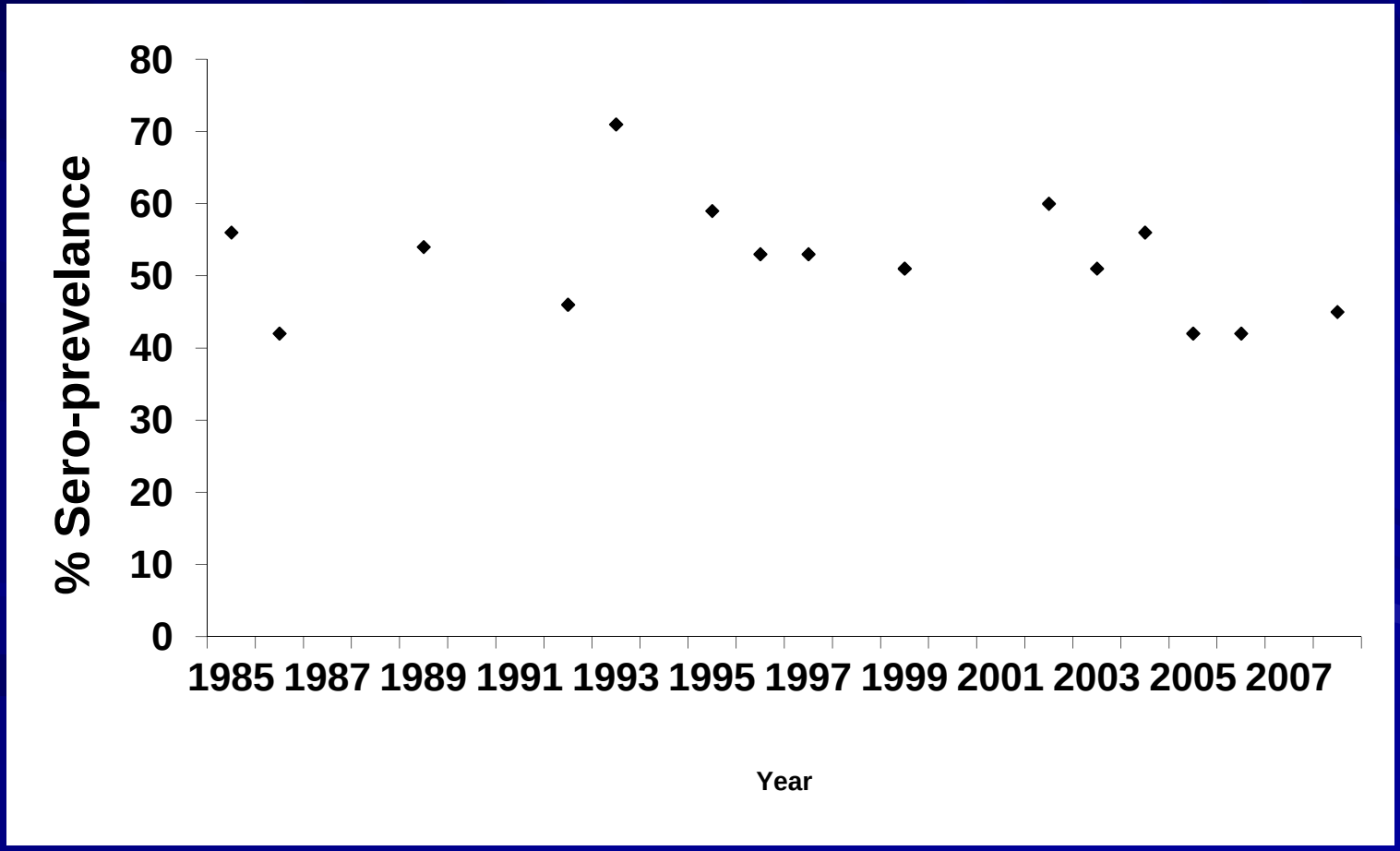
Migration


Seasonal Distribution of Yellowstone Bison
General patterns of movement during fall and winter
MT
WY
MT
ID
ID
WY
Breeding range (July-Aug)
Fall-winter range (Sept-May)
Bison movement routes
Major roads

Brucellosis

Infection

Population estimates of sero-prevalence



➢Brucellosis sero-prevalence by age and sex

Gender	Age	% sero-positive
Male	calf	11
	yearling	35
	≥ 2	62
Female	calf	13
	yearling	35
	2	52
	3	67
	4	69
	≥ 5	69

Interagency Bison Management Plan (2000)

- Objectives (NPS, USFS, APHIS, MT)
  - Conserve free-ranging bison
  - Minimize brucellosis transmission to cattle
- Manage disease risk at park boundary
- Adaptive management
  - Resolve uncertainties about ability to keep bison and cattle separate, effectiveness of vaccination to build herd immunity, and identify conservation area boundary that that minimizes safety and property damage.

Manage Brucellosis Transmission Risk

- Separation to prevent bison-cattle mixing
- Cattle management
- Management culls and harvests
- Adaptive management
- Research: disease dynamics/transmission

Genetic similarities of *B. abortus* isolates from bison, elk, and cattle in the greater Yellowstone area (Beja-Pereira et al. 2009, O'Brien et al. unpublished manuscript).

- Isolates from cattle and elk in Wyoming and Idaho were nearly identical, but highly divergent from bison isolates.
- Isolates from cattle and elk in Montana overlap somewhat indicating they have some common ancestry.
- Infected cattle populations in Montana are spatially isolated from Yellowstone bison by 20 or more miles.
- Thus, elk, not bison, were the reservoir species of origin for recent cattle infections in Wyoming, Idaho and Montana.

Bayesian state space model to guide adaptive management of Yellowstone bison (Hobbs et al. 2009).

- Maintenance of brucellosis in Yellowstone bison is frequency-dependent

- 10% of adult females were infectious.

- The probability that a susceptible bison would become infected via horizontal transmission varied annually between 10 and 20%.

- Vertical transmission accounted for few transmission events.

Risk of Transmission model. Kilpatrick et al. (2009)

- The risk of brucellosis transmission from bison to cattle likely to be a relatively rare event, even under a no management of bison type strategy.

- The risk of transmission of brucellosis from bison to cattle will increase with increasing bison numbers and severe snow fall or thawing and freezing events.

Timing and location of bison parturition events (Jones et al. 2010).

- Observed abortions occurred from January through 19 May, while peak calving (80% of births) occurred from 25 April to 26 May, and calving was finished by 5 June.

- Observed parturition events occurred in the park and on the Horse Butte peninsula in Montana (No cattle any time of the year).

Probability of bison and elk interacting on a shared winter range (Proffitt et al. 2010).

- Spatial overlap between bison and elk increased through winter and peaked when late-term abortion events and parturition occurred for bison.

- Despite this relatively high risk of transmission, levels of elk exposure to *B. abortus* (2-4%) were similar to those in free-ranging elk populations that do not commingle with bison (1-3%), suggesting that *B. abortus* transmission from bison-to-elk under natural conditions is rare.

Estimating rates of incidence and routes of transmission of *B. abortus* bacteria among Yellowstone bison (unpublished data).

- The median probabilities of horizontal and vertical exposure to calves is 0.10 & 0.08 respectively

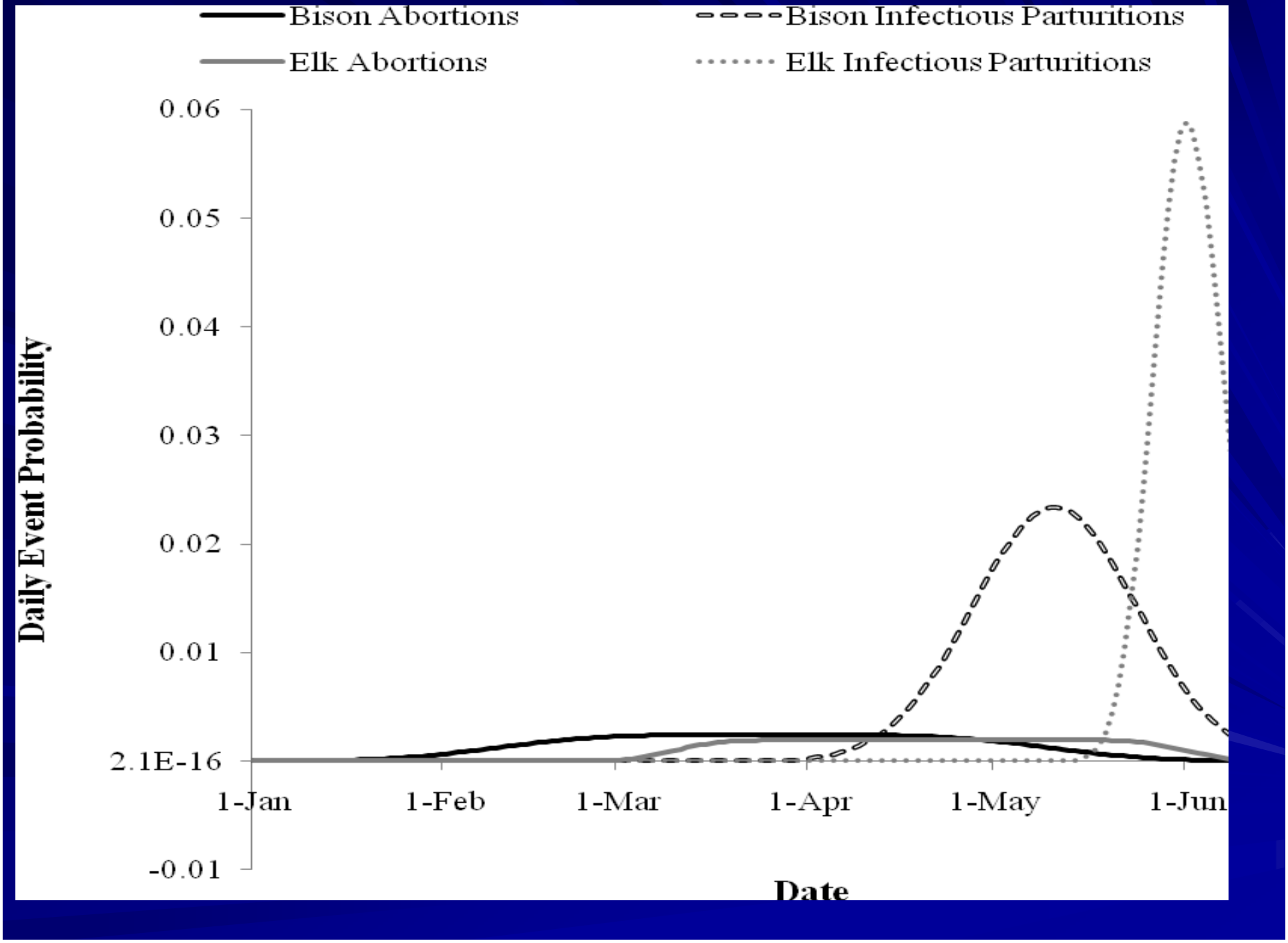
- snow pack severity exacerbates incidence.

- Brucellosis is maintained through mixed transmission modes and the duration of infection may extend beyond the acute phase.

Brucellosis transmission risk among bison, elk, and cattle in the northern portion of the greater Yellowstone area (Schumaker et al. 2010).

- The estimated percentage of cattle exposure risk from the Yellowstone bison herd was small (0.0-0.3% of total risk) compared with elk which contributed 99.7-100% of the total risk.

- Natural herd migration and boundary management operations were important in minimizing the contribution of bison to cattle exposure risk, which supports continued boundary management operations for separation between bison and cattle.

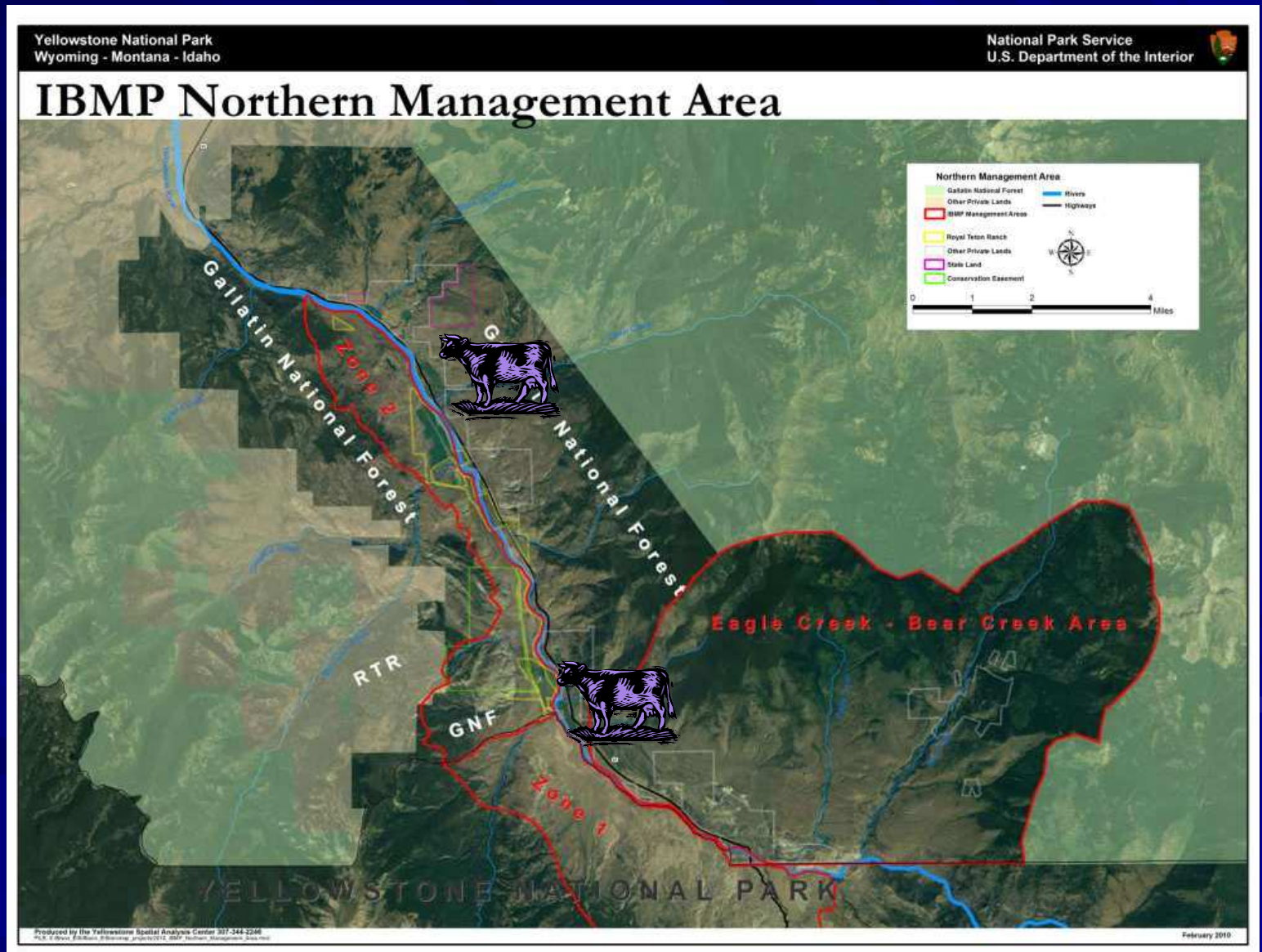

Bison Abortions
Bison Infectious Parturitions
Elk Abortions
Elk Infectious Parturitions
0.06
0.05
0.04
0.03
0.02
0.01
2.1E-16
-0.01
Daily Event Probability
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
Date

Effectiveness of IBMP

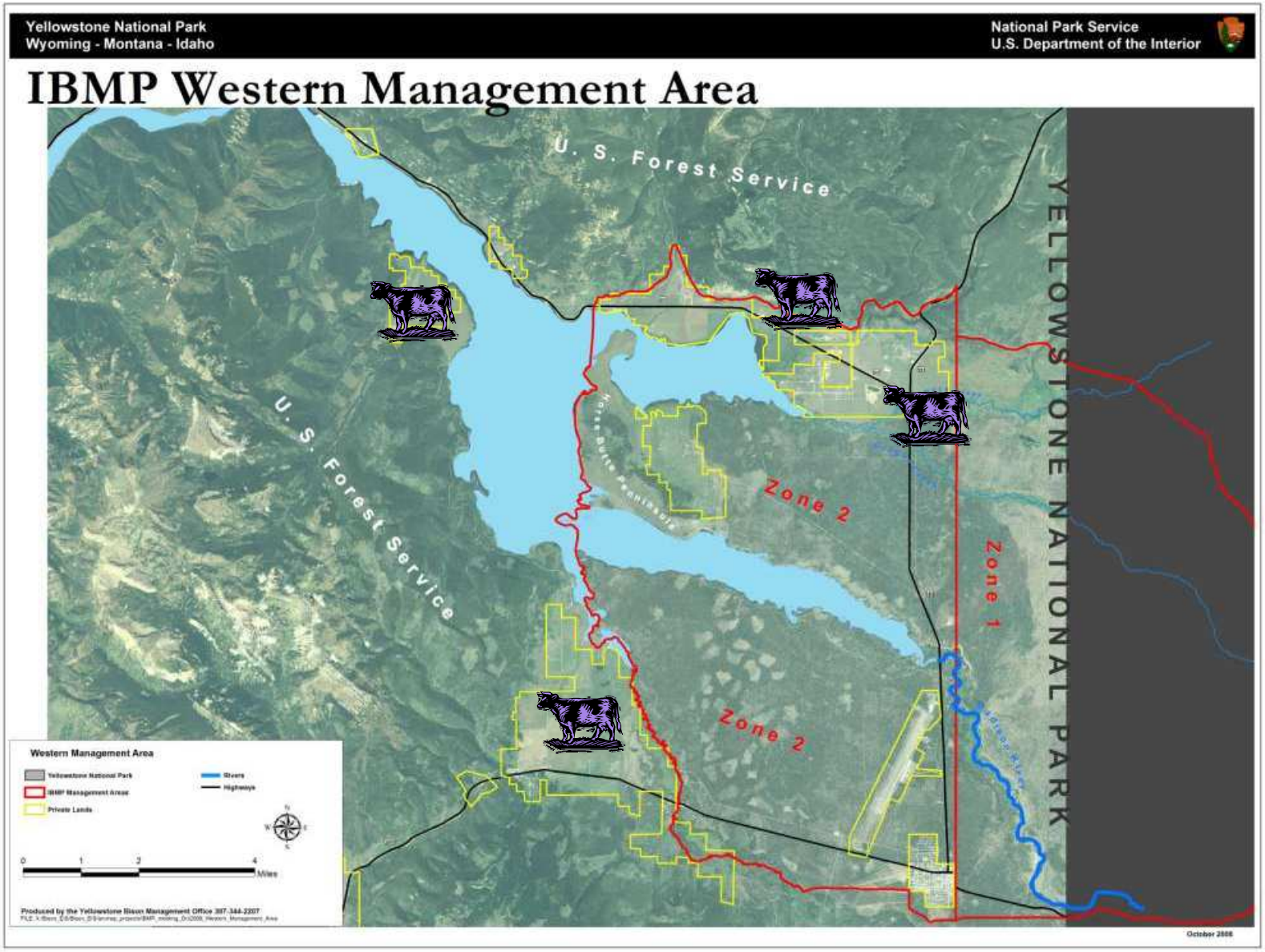
- Conservation of bison successful
- No bison transmission to cattle

- Intense management
- No prevalence reduction
- Large-scale culls (>1000)
- Elk not considered
- Little tolerance in Montana

Cattle: North Area



Cattle: West Area

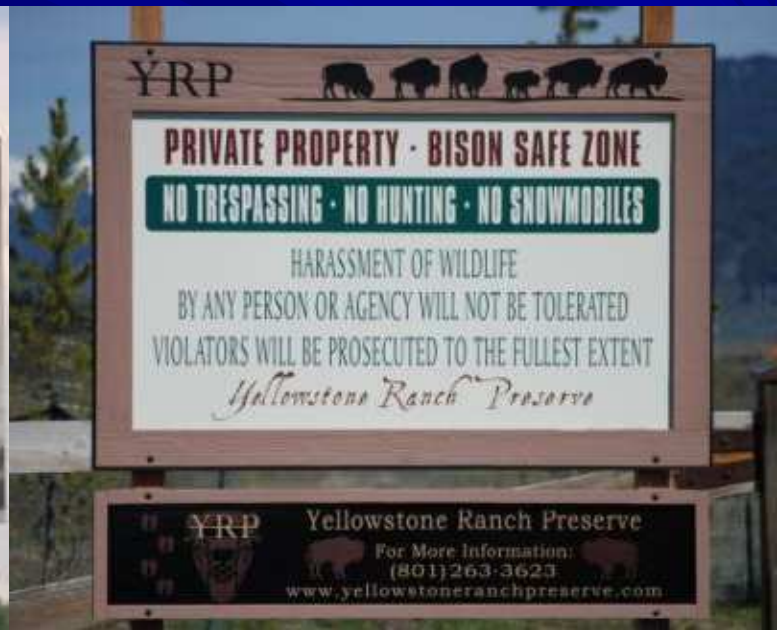


Adaptive Management Plan 2008

- Bison allowed on Horse Butte (West Area)
- Preserve a free-ranging bison population
  - 3,000 to 3,500 bison on average
  - Hunting (outside park); Slaughter; Quarantine
- Manage brucellosis risk
  - Separation from cattle
- Reduce disease prevalence
  - Vaccination and selective culling of infectious bison

Changes: Cattle & Land Use

- 2009 Cattle off Royal Teton Ranch (North)
- 2010 APHIS Interim Plan (brucellosis)
- Tourism and bison-friendly landowners



Winter 2012

- Predicted Migration: 800 north; 500 west
- Conflicts (cattle; safety; property)
- Management Plan
  - Remove ~350 bison (hunt, slaughter, tribes)
  - Lower abundance, suppress the disease, and address treaty/trust responsibilities

Bison Vaccination

Bison vaccination began in 2004

North Boundary – 288
West Boundary – 5

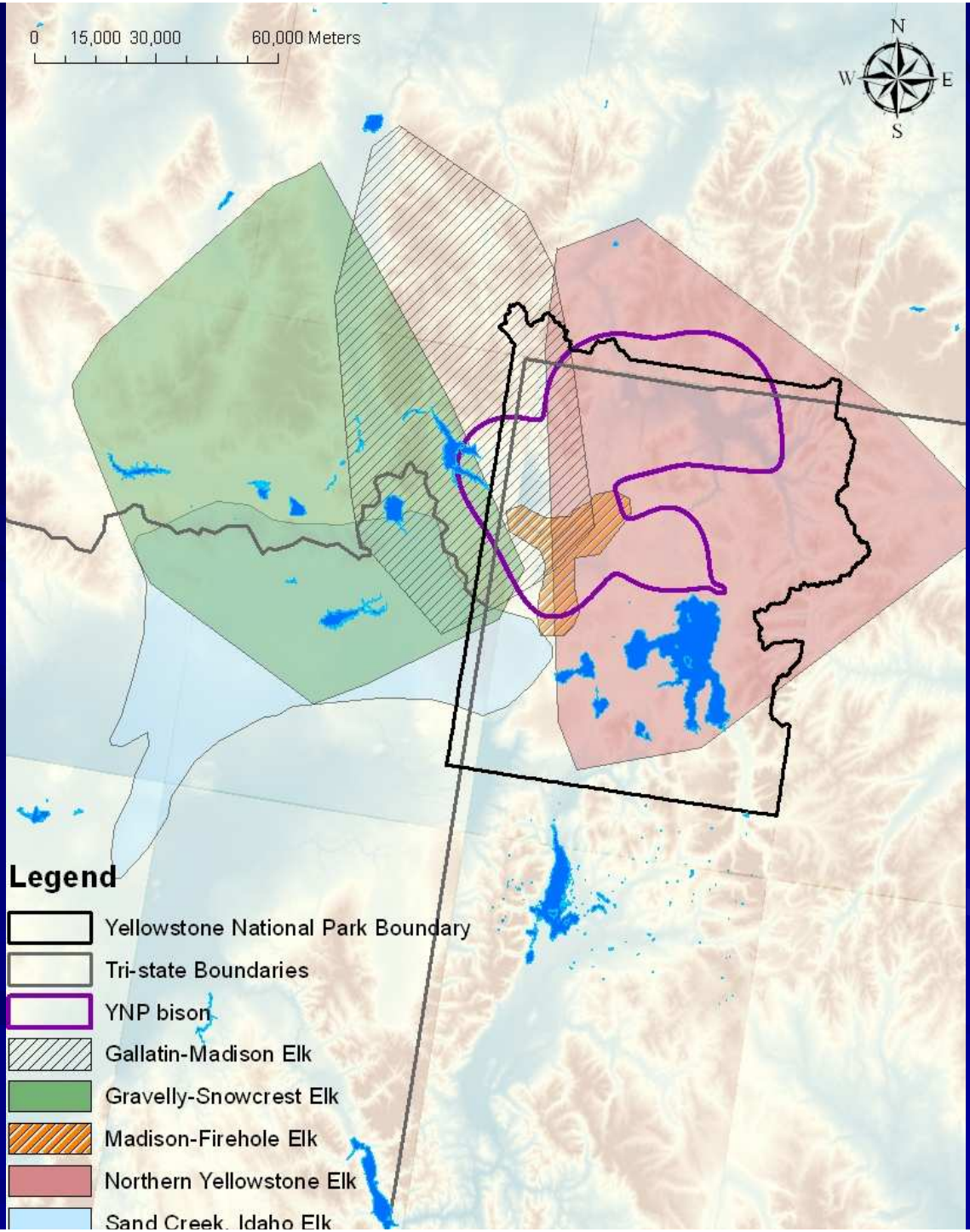
Inconsistently implemented due to broader risk management strategy

Managers agreed in 2011 to implement a more consistent strategy of vaccinating each year.

Bison Vaccination

- Draft Environmental Impact Statement
- Whether to implement remote delivery vaccination of bison
- Compressed air rifle
- Absorbable projectile with vaccine payload


Questions?
ONE WAY


0 15,000 30,000 60,000 Meters
N
W
E
S
Legend
Yellowstone National Park Boundary
Tri-state Boundaries
YNP bison
Gallatin-Madison Elk
Gravelly-Snowcrest Elk
Madison-Firehole Elk
Northern Yellowstone Elk
Sand Creek, Idaho Elk